West Lake Landfill

Radiological Survey

May 16, 2013

Hazardous Waste Program
Federal Facilities Section
May 2013

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

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Section 1: Site History

The West Lake Landfill site is on a parcel of approximately 200 acres in Bridgeton, Missouri. The site consists of the Bridgeton Sanitary Landfill, which stopped receiving waste on Dec. 31, 2004, and several old inactive areas with municipal solid waste and demolition debris. The site is divided into two Operable Units, or OUs. OU-1 consists of radiological areas and OU-2 consists of the other landfill areas, which did not receive any radiologically contaminated soil. In 1990, West Lake Landfill was listed on the National Priorities List making it a Superfund site. In May 2008 a Record of Decision was signed for OU-1, which describes the Selected Remedy to contain the radiological contamination using a modified solid waste landfill cover. The Selected Remedy is currently under review by EPA, which is the lead agency for OU-1 portion of this site.

Bridgeton Sanitary Landfill, is currently owned by Bridgeton Landfill LLC, and is a subsidiary of Republic Services Inc. The landfill waste mass encompasses approximately 52 acres with approximately 240 feet below the ground's surface and a total waste thickness of 320 feet. The waste is located in two distinct areas known as the North and South Quarries. Bridgeton was initially permitted on Nov. 18, 1985, and ceased accepting waste on Dec. 31, 2004. See Bridgeton Landfill map at the link below.

http://www.dnr.mo.gov/env/swmp/facilities/documents/bridgetonmap17x22.pdf

On Dec. 23, 2010, Bridgeton/Republic reported the Bridgeton Sanitary Landfill was experiencing elevated temperatures on some gas extraction wells. The facility began testing landfill gas from the gas extraction system and found elevated hydrogen and carbon monoxide and reduced methane concentrations, which is indicative of a subsurface smoldering event. Since then the department has required Bridgeton/Republic to conduct various mitigation activities.

Section 2: Gamma Radiation Survey

Introduction: On May 16, 2013, Missouri Department of Natural Resources, Hazardous Waste Program, Federal Facilities Section staff visited the West Lake Landfill to collect gamma radiation measurements using readily available field screening equipment. Measurements were collected in upwind and downwind directions for comparison. This survey may be used to supplement ongoing data collection by the Department's Environmental Emergency Response, or EER, Section utilizing AreaRAE equipment and previous radiological data collected by the Department of Health and Senior Services, DHSS.

http://www.dnr.mo.gov/env/swmp/facilities/BridgetonSanitaryLandfill-AirSampling.htm

Additional testing with conventional air sampling equipment and other methods may be warranted to further assess site conditions.

Objective: The objective of this survey was to collect radiological readings upwind and downwind from the site using odor as an indication of downwind direction. The upwind and downwind readings were compared for differences in radiological readings.

Observations and Discussion: Wind direction was sporadic during the initial data collection but became predominantly to the northerly direction as the day progressed. Wind direction is recorded near the site by the department's meteorological station. See Section 5, Photo #3.

http://www.dnr.mo.gov/env/swmp/facilities/BridgetonSanitaryLandfill-AirSampling.htm

Radiological data collection was limited to equipment available at the time of the survey (see Section 4: Equipment Description). Radiological readings can differ significantly when on paved, gravel, or soil surfaces, and can also vary with terrain. Higher readings can be obtained in topographic depressions due to increased ground surface area exposure to the detector. To collect representative information, measurements are collected over an extended period of time to get an average result, rather than relying on instantaneous readings. Instruments using different detection technologies, each to better serve a particular intended use, have different sensitivities and response times.

Presentation of Results: Table 1 and Figure 1 below summarize the upwind and downwind readings collected during this survey. Dose rate measurements were estimated by dividing the counts per minute by one thousand. This is based on the operators experience with this specific set of instruments.

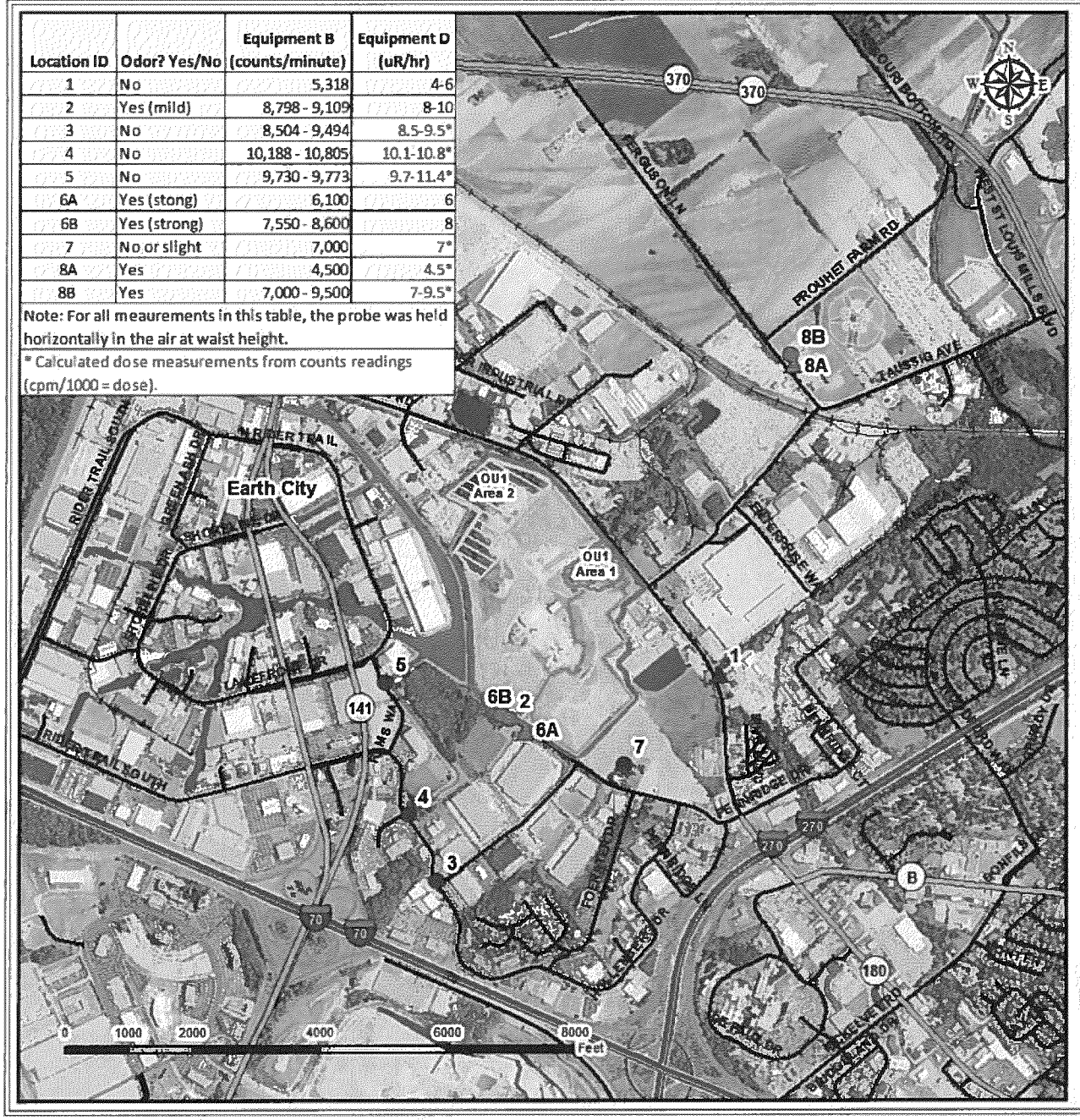
Conclusion: Measurements collected from the downwind location were consistent with measurements collected at the upwind, or background, locations. These observations are consistent with EER AreaRAE data and DHSS's assessment of their previously collected radiological data. They are also consistent with background readings collected using the same equipment in the St Louis area. As stated in the previous section, readings varied based on surface type. The readings from the downwind locations, 8A and 8B, were approximately two-fold different, being pavement vs. grass.

Table 1: Gamma Survey Measurements						
Location ID	Time (approx.)	Surface type	Observed Wind Direction From	Odor? Yes/No	Equipment B (counts/minute)	Equipment D (uR/hr)
1	1500	pavement	Northeast	No	5,318	4-6
2	1510	grass, adjoining gravel road	South	Yes (mild)	8,798 - 9,109	8-10
3	1535	grass, adjoining paved road	Northeast	No	8,504 - 9,494	8.5-9.5*
4	1545	grass	Southeast	No	10,188 - 10,805	10.1-10.8*
5	1600	grass	East	No	9,730 - 9,773	9.7-11.4*
6A	1630	pavement/gravel	South	Yes (strong)	6,100	6
6B	1630	grass	South	Yes (strong)	7,550 - 8,600	8
7	1730	grass	South	No or slight	7,000	7*
8A	1830	pavement	South	Yes	4,500	4.5*
8B	1830	grass island	South	Yes	7,000 - 9,500	7-9.5*
Notes: For all measurements in this table, the probe was held horizontally in the air at waist height. All measurements with Equipment B were taken over a one minute period.						
* Calculated dose measurements from counts readings (cpm/1000 = dose).						

Location ID	Odor? Yes/No	Equipment B (counts/minute)	Equipment D (uR/hr)
1	No	5,318	4-6
2	Yes (mild)	8,798 - 9,109	8-10
3	No	8,504 - 9,494	8.5-9.5*
4	No	10,188 - 10,805	10.1-10.8*
5	No	9,730 - 9,773	9.7-11.4*
6A	Yes (stong)	6,100	6
6B	Yes (strong)	7,550 - 8,600	8
7	No or slight	7,000	7*
8A	Yes	4,500	4.5*
8B	Yes	7,000 - 9,500	7-9.5*

Note: For all meaurements in this table, the probe was held horizontally in the air at waist height.

* Calculated dose measurements from counts readings (cpm/1000 = dose).

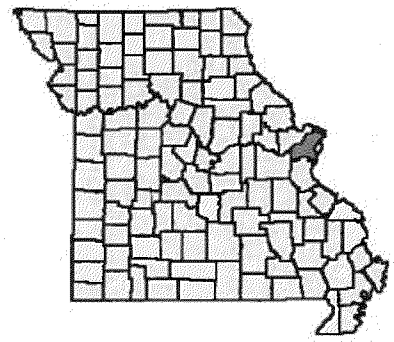


West Lake Landfill Radiological Survey May 16, 2013 Figure 1

Legend

- No odor, grass
- No odor, pavement
- Odor, grass
- Odor, pavement
- Operable Unit 1 - Area 1 (Radiological Area)
- Operable Unit 1 - Area 2 (Radiological Area)
- Buffer Zone/Crossroad Property
- Bridgeton Landfill
- West Lake Landfill Boundary

Epuipment Description:
Set B: Ludlum Model 2221 with sodium iodide scintillator probe (44-10).
Set D: Ludlum Model 19A Micro R Alarm Ratemeter.



Missouri Department of Natural Resources
Division of Environmental Quality
Hazardous Waste Program
Created on May 20, 2013

Section 3: Radiological Activity on Dust Swipe Samples, Alpha and Beta+Gamma

Introduction: Staff also collected dust swipe samples at two locations at the perimeter of the site. These locations were selected since they typically have high odor and may contain dust originating from the site. The first was adjacent to the leachate pumping station southwest of the landfill and the second was a private residence, Turner property, south of the site. Included below are field instrument surveys and benchtop readings of dust swipes. Benchtop readings were collected with a Ludlum model 2929 scalar ratemeter with 43-10-1 detector that was designed for these samples. It is noted that EER has gamma monitors, namely AreaRAE equipment, stationed at these locations. Please see Section 5, photo #4.

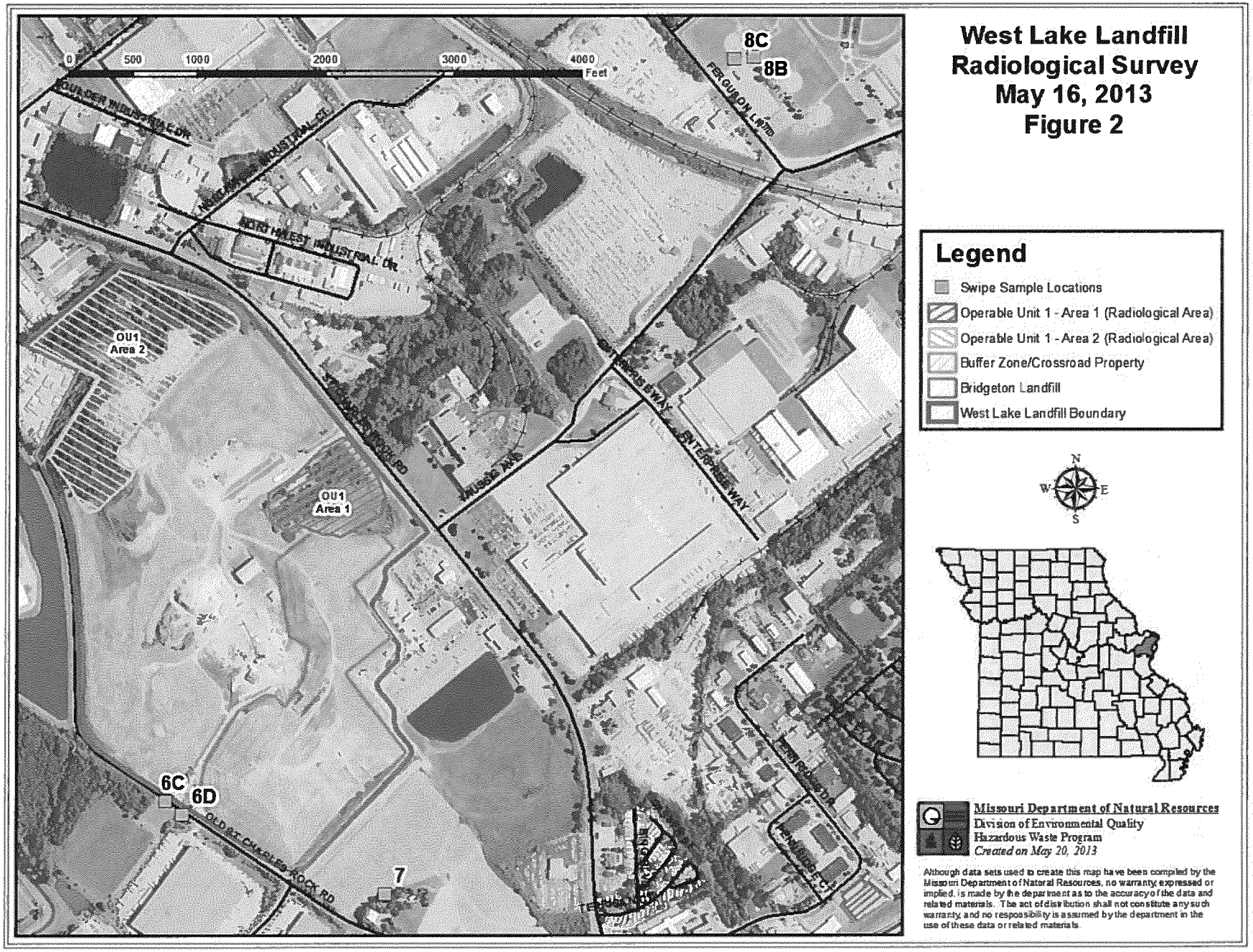
Objective: The objective of this portion of the visit was to collect deposition dust samples to measure radiological activity ~~in~~ the predominant wind direction and in the downwind location at the time of sampling. The dust samples were collected with cloth swipes and analyzed for alpha decay as well as beta and gamma combined decay.

Presentation of Results: Table 2 and Figure 2 below summarize the dust swipe samples collected during this survey.

Table 2: Equipment E, Swipe Sample Results (1 minute duration)

Location ID	Suface type	Odor? Yes/No	alpha (cpm)	beta and gamma (cpm)
Pre use Cs-137 response check	QA/QC check	NA	0	21,294
Empty	Background empty sample	NA	1	48
6C (swipe 1)	Inside of metal pipe	Yes (strong)	0	44
6D (swipe 2)	Area surrounding the supports for the life station where DNR AreaRAE is located	Yes (strong)	1	47
7 (swipe 3)	Picnic table where DNR AreaRAE is located	No or slight	0	43
7 (swipe 4)	Picnic table where DNR AreaRAE is located	No or slight	0	40
8B (swipe 5)	Underside of decorative rock	Yes	0	34
8C (swipe 6)	Barren soil adjoining parking lot	Yes	0	30
Post use Cs-137 response check	QA/QC check	NA	0	20,779

Conclusion: Results from dust swipe samples collected near the site were consistent with background readings of the empty instrument tray.



Section 4: Equipment Description

- Equipment B: Ludlum model 2221 with 44-10 sodium iodide [NaI] probe. The meter has both digital and analog scales, is able to provide both instantaneous rates and accumulative counts over a user set time, and has field adjustable voltage settings to give the user some flexibility in selection of probes and focusing on feedback at different energy levels to help evaluate readings. The 44-10 probe is a gamma scintillator. This combination of meter and probe is favored for searching for radiological contamination because of its sensitivity, fast response to activity fluctuations and flexibility in settings to help in discerning results. We would typically read the meter as an instantaneous rate when looking for hotspots, primarily focused on listening to audio feedback changes; then switch to an accumulative count when getting fluctuations in readings and wishing to better evaluate what is being detected. We typically do a 1 minute count, but can do a much longer time if needed and divided by the number a minutes. Typical background readings are 4 to 5 significant digits, depending upon material, for counts per minute, or cpm. A rough estimate of a comparable uR/hr reading can be obtained by dividing the results by 1,000.
- Equipment D: Ludlum model 19A uR meter. This meter with built in detector has a fixed analog scale and can only give feedback as a rate in uR/hr. It is meant to give fast and easy dose estimates in areas of low activity levels and to provide an alarm as activity begins to approach a preset action level. The instrument needle is constantly moving in response to activity such that visual precision is several uR/hr. Results are most easily presented as a range.
- Equipment E: Ludlum model 2929 with 43-10-1 swipe counter. This is a bench top meter and probe designed for counting swipe samples. These samples are small cloth patches used to retrieve dust. Readings are in cpm for alpha and combined beta+gamma. Background readings are typically 3 cpm or less for alpha, and 50 to 60 cpm or less for beta, depending upon location.

Section 5: Photographic Log

Photo 1: Location #4 looking Northeast toward landfill.

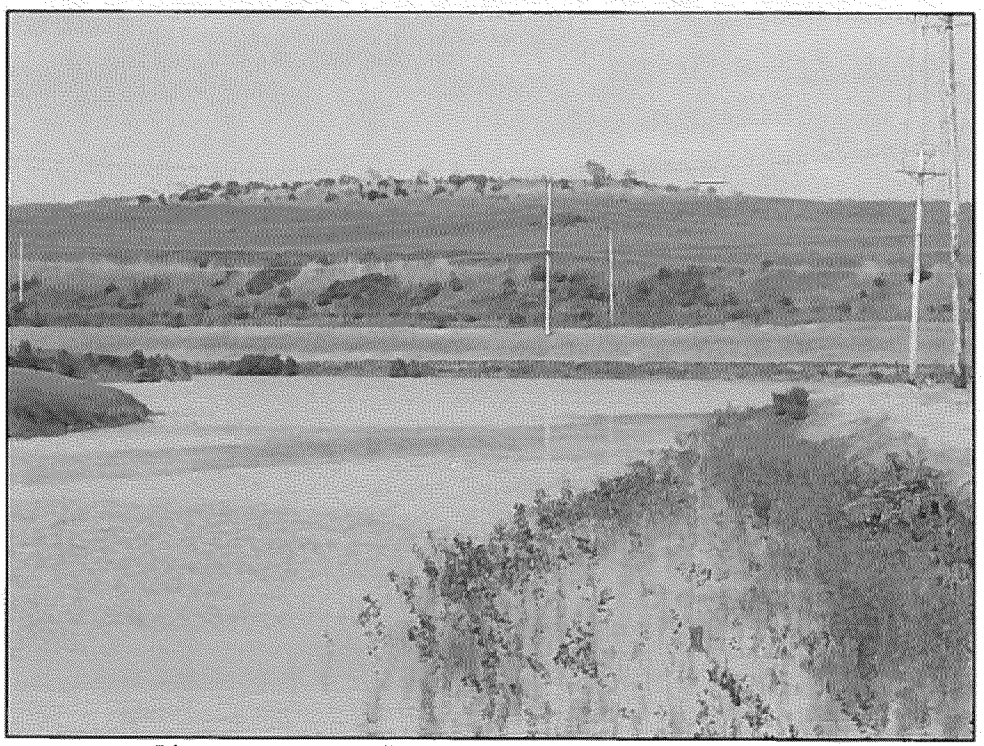


Photo 2: Location #5 looking Northeast toward landfill.

Photo 3: Location #7, Turner property, looking North toward landfill. Note the meteorological station in left foreground.

Photo 4: View of AreaRAE equipment at Location #7, Turner property. Swipe samples #3 and #4 collected at this location.